

Job Set #48



Dart Aerospace Ltd.
1270 Aberdeen St
Hawkesbury, ON
K6A 1K7
Canada

Tel (613) 632-5200

D5350-041

Job Sheet 174730



Part No: D5350-041

Job Qty: 1 ea

Part Name: Fwd Cross Beam Assembly



Part Weight: 0 lbs

Status: Scheduled

Priority: Medium

Job Created: 3/20/18

Job Tracking No:

Due Date: 4/20/18

Created By: Michelle Gagnon-Donovan

Type: SOLD

Description:

Note: DWG REV D SHEET 1 IPP REV:A 15.12.11 NEW ISSUE DD VERF:JLM IPP REV:B 16.01.25 rev.a dwg DD
VERF:JLM IPP REV:C 16.06.30 DWG REV.B DD VERF:JLM IPP REV:D 17.01.09 DWG REV.c DD VERF:JLM
IPP REV:E DWG. REV.D 17/04/11 JFS VERIFIED BY: DD

Ship Via:

Bill of Materials

Job Routing

Op No	Operation	Qty	Start Date	Due Date	Standard	Workcenter/Supplier		Sign-off
					Setup Run hrs Hrs	Workcenter / Supplier	Lead Time	
90	Start up Operation	1 Ea	4/20/18	4/20/18	0.00 0.00	Start Up Machining-4		all
100	Bandsaw	1 pcs	4/20/18	4/20/18	0.00 0.04	Bandsaw1		all
110	CNC Vertical Machining	1 pcs	4/20/18	4/20/18	1.26 2.22	HAAS1-2		all
120	QC	1 pcs	4/20/18	4/20/18	0.00 0.00	QC2 Machining-4		all
130	Mill Conv	1 pcs	4/20/18	4/20/18	0.00 2.00	Mill Conv 1		all 18-05-15
140	QC	1 pcs	4/20/18	4/20/18	0.00 0.00	QC8		all 18-05-15
150	Skidtubes	1 pcs	4/20/18	4/20/18	0.00 0.11	Skidtubes-3		all
160	QC	1 pcs	4/20/18	4/20/18	0.00 0.00	QC5		all
170	HandFinish	1 pcs	4/20/18	4/20/18	0.00 0.10	HandFinish1		all 18-05-16
180	QC	1 pcs	4/20/18	4/20/18	0.00 0.00	QC7-5		all 18-5-16
190	Powdercoat	1 pcs	4/20/18	4/20/18	0.00 0.10	Powdercoat1		all 18-5-16
200	QC	1 pcs	4/20/18	4/20/18	0.00 0.00	QC3		all
210	Small Fab	1 pcs	4/20/18	4/20/18	0.00 0.47	Small Fab-9		all
220	QC	1 pcs	4/20/18	4/20/18	0.00 0.00	QC5		all
230	Packaging	1 pcs	4/20/18	4/20/18	0.00 0.00	Packaging3-2		all
240	QC21-SA	1 Ea	4/20/18	4/20/18	0.00 0.00	QC21		all

M+38760 138839 START: 7:45 OUT: 3:20 FINISH: 9:15



Container No: S066638



Part: D5350-041

Job No: 174730

Serial No/Batch: S066638

Revision:

Inspector:

1270 ABERDEEN STREET
HAWKESBURY, ON K6A 1K7
CANADA
TEL.: 1 613 632-5200
Email: sales@dartaero.com
www.dartaerospace.com

Date: 04/29/18

003268

Job BOM

Part / Item	Component Name	Quantity	Operation	Container
M6061T6B1.000X06.000	6061T6 Bar 1.00 X 6.00	5.7750 ft (5.775 ea)	90-Start up Operation	
AN3-13A	Bolt	2 Ea (2 ea)	210-Small Fab	5038733
CBL-1240	Cable	5.4200 ft (5.42 ea)	210-Small Fab	5021438
CBL-460	Loop Sleeve	10 Ea (10 ea)	210-Small Fab	5047302
D5324-3	Bracket	1 Ea (1 ea)	210-Small Fab	F161326
D5346-3	Bushing	4 Ea (4 ea)	210-Small Fab	F161327 71x
D5350-5	Adapter	1 Ea (1 ea)	210-Small Fab	F163122
MS17984-C412	Pin, Quick Release	2 Ea (2 ea)	210-Small Fab	F1136593 ex 5043972
MS17984-C418	Quick Release Pin	1 pcs (1 ea)	210-Small Fab	5036480
MS17984-C517	Pin, Quick Release	2 Ea (2 ea)	210-Small Fab	5000375
MS21042L3	Nut	2 Ea (2 ea)	210-Small Fab	505407
NAS1149D0316J	Washer	4 Ea (4 ea)	210-Small Fab	F1139502-2

Job Allocations

Operation	Component Part	Required	Inventory	Allocated
90-Start up Operation	M6061T6B1.000X06.000	6	68	0
210-Small Fab	AN3-13A	2	60	0
	CBL-1240	5	447	0
	CBL-460	10	387	0
	D5324-3	1	61	0
	D5346-3	4	11	0
	D5350-5	1	5	0
	MS17984-C412	2	15	0
	MS17984-C418	1	25	0
	MS17984-C517	2	50	0
	MS21042L3	2	2,712	0
	NAS1149D0316J	4	856	0

Part Specifications

Specifications could not be found.

Plex 3/20/18 3:31 PM Dart.Gagnon.Michelle

DART AEROSPACE LTD		Work Order:	174730
Description: Fwd Beam		Part Number:	D5350-1
Inspection Dwg: D5350 Rev: D		Page 1 of 2	

INSPECTION SHEET

Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
Ø0.257	+0.006/-0.001	0.257	✓		Pin gage	
0.40	+/-0.030	.401	✓		high gage	
1.00	+/-0.030	1.000	✓		high gage	
1.20	+/-0.030	1.200	✓		high gage	
2.00	+/-0.030	1.998	✓		high gage	
0.65	+/-0.030	.645	✓		vernier	
3.15	+/-0.030	3.160	✓		vernier	
0.716	+0.010/-0.020	.716	✓		"	
37.20	+/-0.030	37.20	✓		tape	
39.70	+/-0.030	39.70	✓		tape	
0.300	+/-0.010	.295	✓		vernier	
0.25	+/-0.030	.244	✓		vernier	
0.280	+0.015/-0.005	.285	✓		high gage	
12.000	+/-0.005	12.000	✓		vernier	
9.06	+/-0.030	9.070	✓		vernier	
0.62	+/-0.030	.615	✓		vernier	
0.80	+/-0.030	.798	✓		vernier	
5.22	+/-0.030	5.210	✓		high gage	
4.05	+/-0.030	4.048	✓		high gage	
2.55	+/-0.030	2.55	✓		high gage	
0.30	+/-0.030	.302	✓		high gage	
0.35	+/-0.030	.344	✓		vernier	
0.750	+/-0.005	.752	✓		vernier	
0.55	+/-0.030	.551	✓		high gage	
1.00	+/-0.030	1.008	✓		vernier	
0.550	+/-0.010	.557	✓		vernier	
0.225	+/-0.010	.224	✓		vernier	
Ø0.323	+0.006/-0.001					
1.00	+0.030/-0.000					
0.600	+/-0.005					
0.045 x 45°	+/-0.015 x +/-0.5°	0.060 x 45°	✓		Vernier	
2.05	+0.030/-0.010	2.049	✓		high gage	
1.030	+0.015/-0.000	1.032	✓		vernier	
0.250	+0.015/-0.010	.249	✓		vernier	
0.480	+/-0.015	.480	✓			
Ø0.375	+0.004/-0.010	0.375	✓		Pin gage	
0.415 x 90°	+/-0.010 x +/-0.5°	.425, 90°	✓		vernier	
4.23	+/-0.030	4.236	✓		vernier	
0.30	+/-0.030	.294			vernier	

DART AEROSPACE LTD		Work Order:	174730
Description: Fwd Beam		Part Number:	D5350-1
Inspection Dwg: D5350 Rev: D		Page 2 of 2	

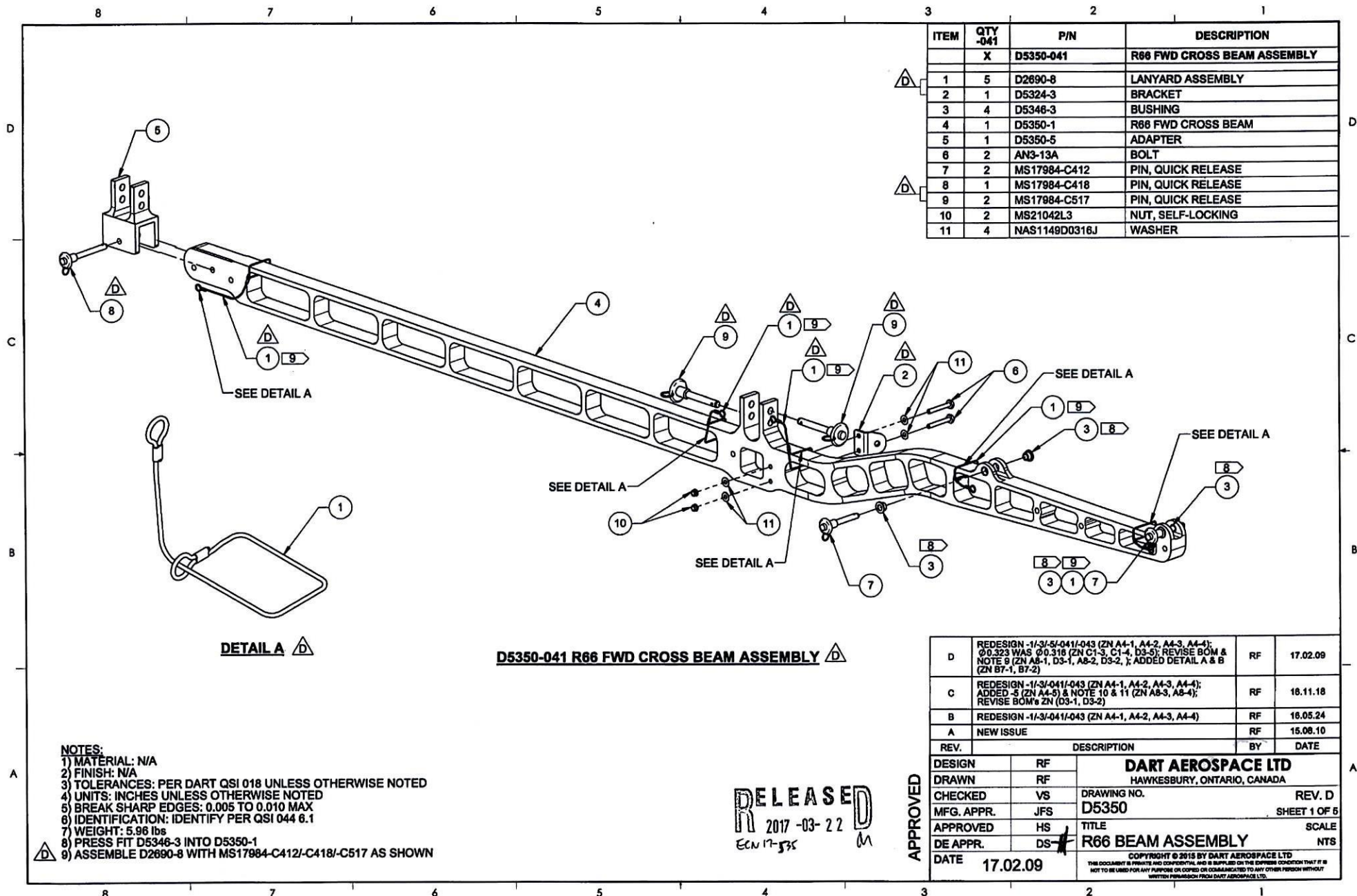
INSPECTION SHEET

Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
0.25	+/-0.030	.250	✓		Vernier	
Ø0.204	+0.005/-0.001	.2058	✓		Ring gauge	
0.30	+/-0.030	.300	✓		Vernier	
2.50	+/-0.030	2.501	✓		Vernier	
66.78	+/-0.030	66.80	✓		Tape	
0.25	+/-0.030	.248	✓		Vernier	
0.51 – 0.45	N/A	0.450	✓		"	
2.50	+/-0.030	2.500	✓		Vernier	
0.50	+/-0.020	.499	✓		Vernier	
1.50	+/-0.030	1.502	✓		Vernier	
1.30	+/-0.030	1.300	✓		Vernier	

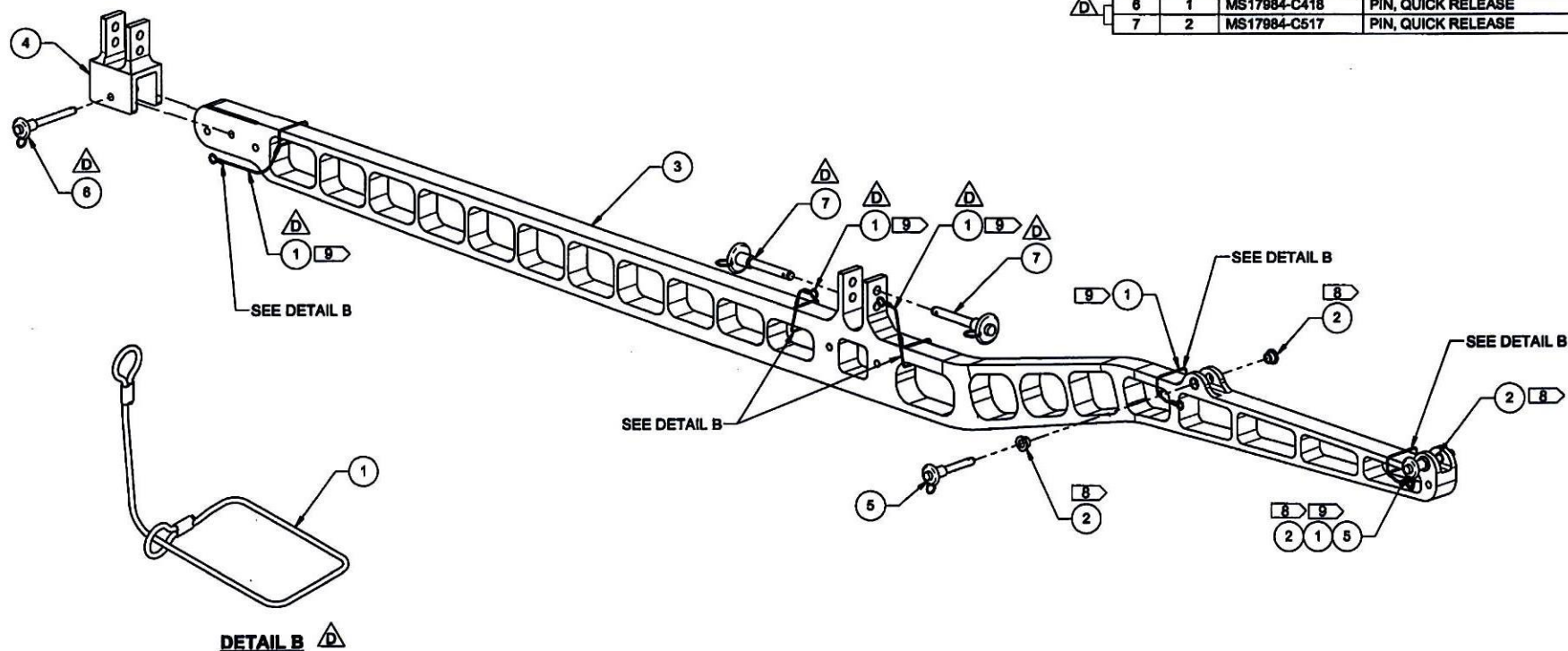
Measured by:	mm/bk	Checked by:	La	QC Inspector:	
Date:	28 Apr. 2018	Date:	18-05-15	Date:	

Engineering Approval: (If necessary)		Date:	
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Rev	Date	Change	Revised by	Approved
A	17.07.18	New Issue	KJ	



ITEM	QTY	P/N	DESCRIPTION
	X	D5350-043	R66 AFT CROSS BEAM ASSEMBLY
1	1	D2690-8	LANYARD ASSEMBLY
2	4	D5346-3	BUSHING
3	1	D5350-3	R66 AFT CROSS BEAM
4	1	D5350-5	ADAPTER
5	2	MS17984-C412	PIN, QUICK RELEASE
6	1	MS17984-C418	PIN, QUICK RELEASE
7	2	MS17984-C517	PIN, QUICK RELEASE



D5350-043 R66 AFT CROSS BEAM ASSEMBLY

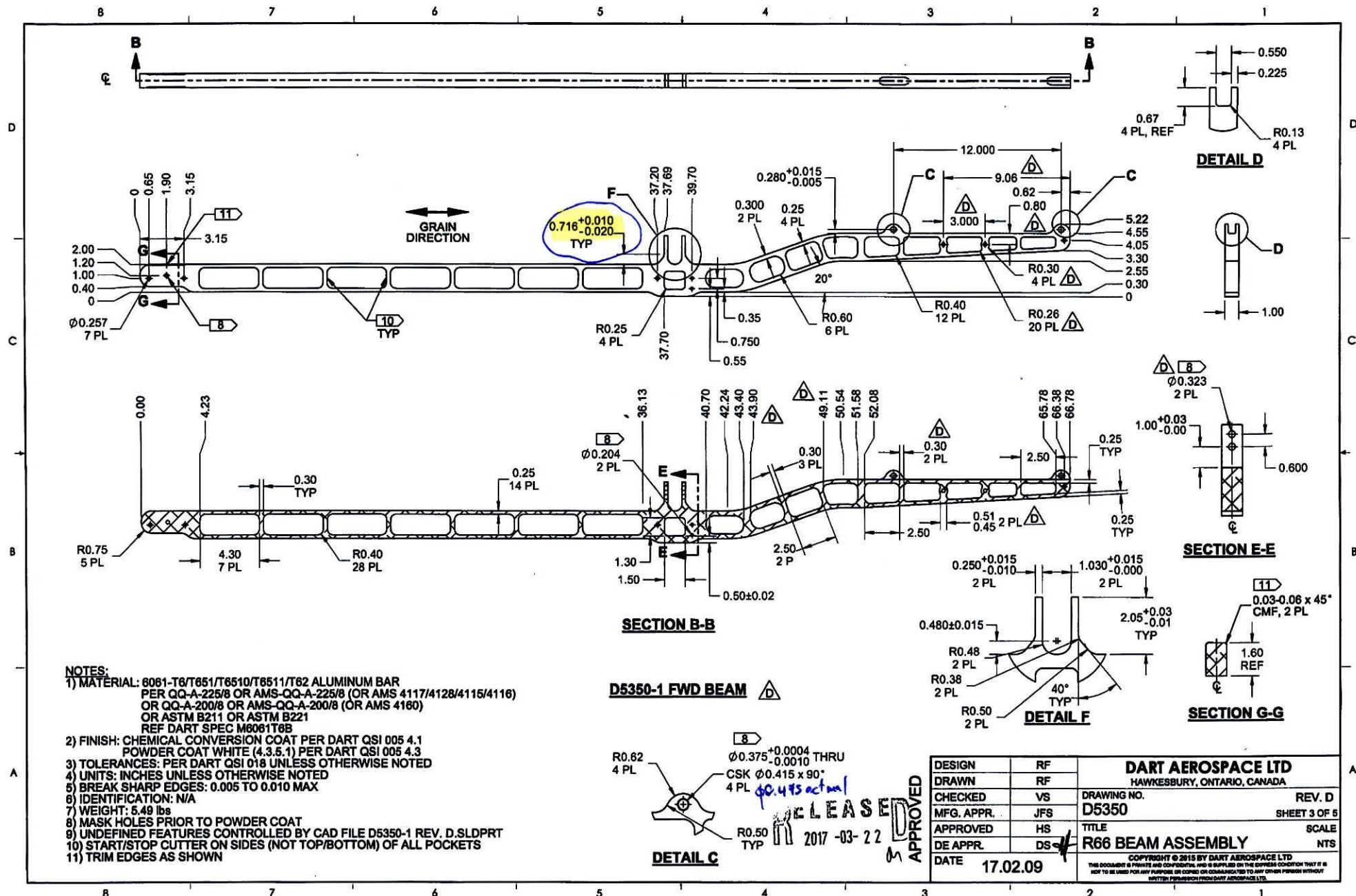
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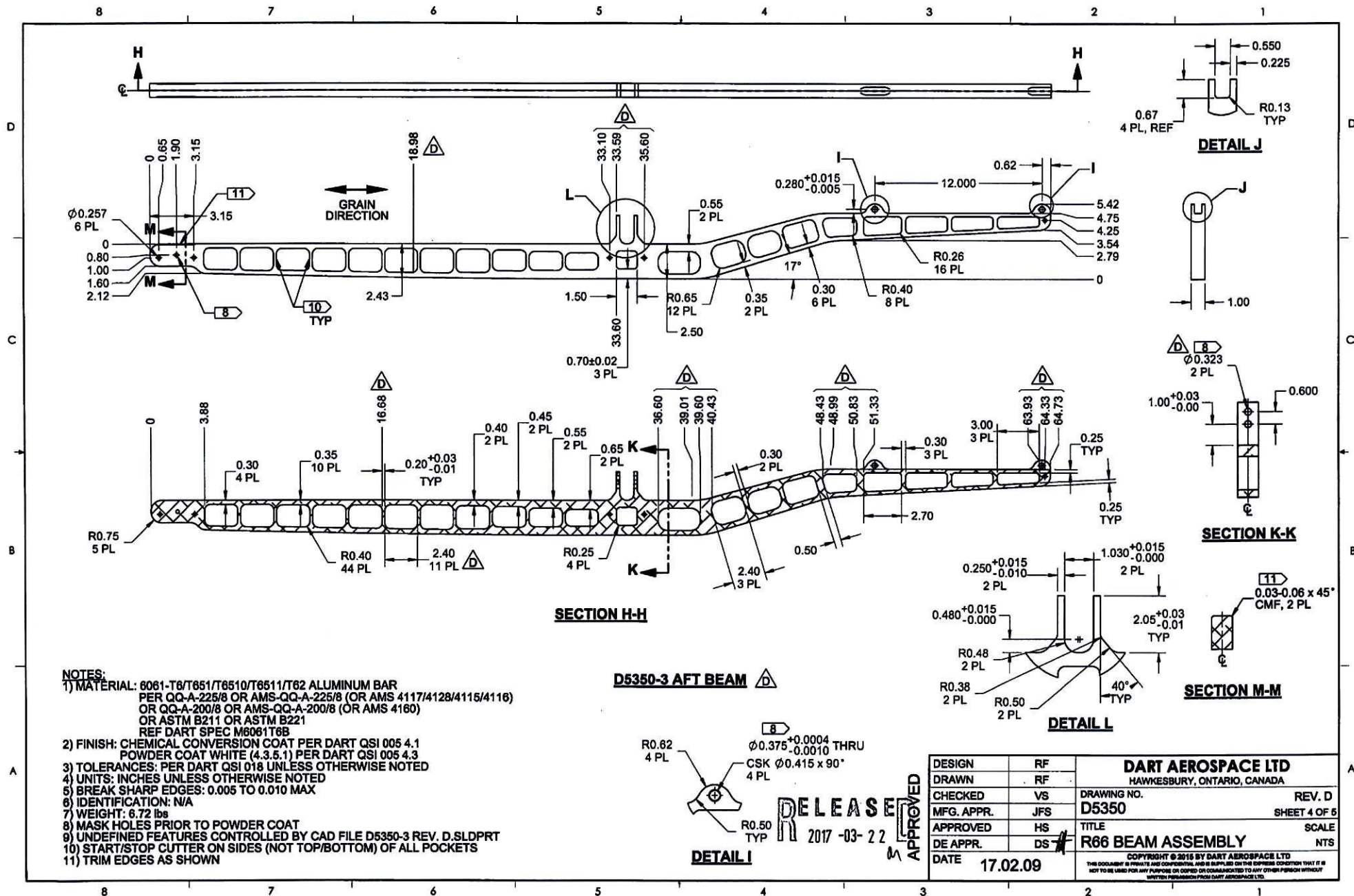
- 1) MATERIAL: N/A
- 2) FINISH: N/A
- 3) TOLERANCES: PER DART QSI 018 UNLESS OTHERWISE NOTED
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX
- 6) IDENTIFICATION: IDENTIFY PER QSI 044 6.1
- 7) WEIGHT: 7.10 lbs
- 8) PRESS FIT D5346-3 BUSHING INTO D5350-3 BEAM
- 9) ASSEMBLE D2690-8 WITH MS17984-C412/-C418/-C517 AS SHOWN

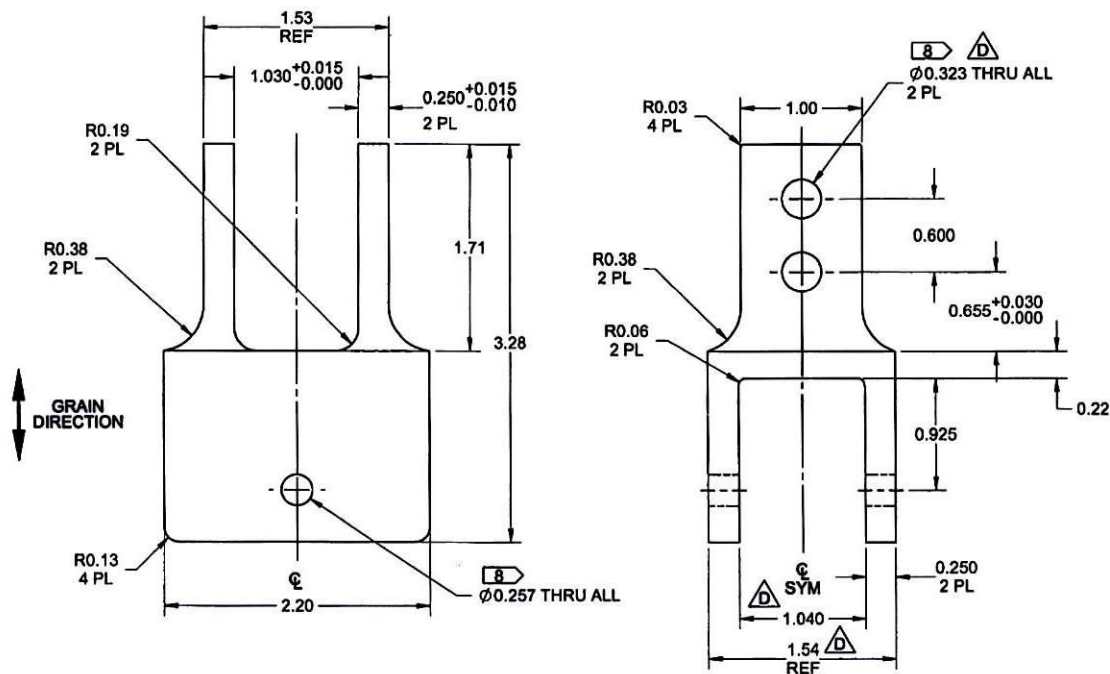
RELEASED
2017-03-22

APPROVED

DESIGN	RF	DART AEROSPACE LTD	
DRAWN	RF	HAWKESBURY, ONTARIO, CANADA	
CHECKED	VS	DRAWING NO.	REV. D
MFG. APPR.	JFS	D5350	SHEET 2 OF 5
APPROVED	HS	TITLE	SCALE
DE APPR.	DS	R66 BEAM ASSEMBLY	NTS
DATE	17.02.09	COPYRIGHT © 2015 BY DART AEROSPACE LTD	
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D5350-5 ADAPTER

NOTES:

- 1) MATERIAL: 6061-T6/T651/T6510/T6511/T62 ALUMINUM BAR
PER QQ-A-225/8 OR AMS-QQ-A-225/8 (OR AMS 4117/4128/4115/4116)
OR QQ-A-200/8 OR AMS-QQ-A-200/8 (OR AMS 4160)
OR ASTM B211 OR ASTM B221
REF DART SPEC M8061T6B
- 2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1
POWDER COAT WHITE (4.3.5.1) PER DART QSI 005 4.3
- 3) TOLERANCES: PER DART QSI 018 UNLESS OTHERWISE NOTED
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX
- 6) IDENTIFICATION: N/A
- 7) WEIGHT: 0.30 lbs
- 8) MASK HOLES PRIOR TO POWDER COAT

RELEASED
2017-03-22

APPROVED

DESIGN	RF	DART AEROSPACE LTD	
DRAWN	RF	HAWKESBURY, ONTARIO, CANADA	
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DQA: DAS Date: _____
53
 QA Closed: 9-89 Date: MAY 28 2018

WORK ORDER NON-CONFORMANCE / UPDATE



Work Order update only ☐

Work Order: <u>174730</u> Part No. <u>D5350-041</u> NCR No. <u>18-6875</u>		DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☒ Suspected Unapproved ☐		AGAINST DEPARTMENT/PROCESS <table style="width:100%;"> <tr> <td>Skid-tube</td><td>☐</td> <td>Cross tube</td><td>☐</td> <td>Water Jet</td><td>☐</td> <td>Engineering</td><td>☐</td> </tr> <tr> <td>Machining</td><td>☒</td> <td>Small Fab</td><td>☐</td> <td>Prod. Eng. Coord.</td><td>☐</td> <td>Quality</td><td>☐</td> </tr> <tr> <td>Thermofforming</td><td>☐</td> <td>Finishing</td><td>☐</td> <td>Rec/Store/Packaging</td><td>☐</td> <td>Other</td><td>☐</td> </tr> <tr> <td>Large Fab</td><td>☐</td> <td>Composite</td><td>☐</td> <td>Supplier</td><td>☐</td> <td></td><td></td> </tr> </table>						Skid-tube	☐	Cross tube	☐	Water Jet	☐	Engineering	☐	Machining	☒	Small Fab	☐	Prod. Eng. Coord.	☐	Quality	☐	Thermofforming	☐	Finishing	☐	Rec/Store/Packaging	☐	Other	☐	Large Fab	☐	Composite	☐	Supplier	☐																																																																																																
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Date: <u>18/5/14</u>		Step #: <u>100</u>		QTY Effective: <u>1</u>		MRB (QSI042) Approval <u>DAS</u> <u>12</u> <u>9-89</u> <u>18/5/14</u>																																																																																																																																	
Description Work Order Deviation Basket attachment holes chamfered on one side to $\phi 0.50 \times 90^\circ$ instead of $\phi 0.415 \times 90^\circ$.				Disposition Acceptable. Per attached analysis, the strength of a single deformed leg is stronger stronger than the entire entire load applied to the basket per TR-D066-1016-1 Rev A.																																																																																																																																			
				Completed By <u>DAS</u> <u>12</u> <u>9-89</u> <u>18/5/14</u>		Lead hand / Supervisor Approval Verification <u>DAS</u> <u>9</u> <u>9-89</u> <u>18-05-22</u>																																																																																																																																	
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Root Cause <table style="width:100%;"> <tr><td>Environment</td><td>☐</td><td>No Re-verification</td><td>☐</td></tr> <tr><td>Design</td><td>☒</td><td>Operator</td><td>☐</td></tr> <tr><td>Doc/Data</td><td>☐</td><td>Offset/Setup</td><td>☐</td></tr> <tr><td>Equip/Tooling</td><td>☐</td><td>Supplier</td><td>☐</td></tr> <tr><td>Handling/Pre</td><td>☐</td><td>Training</td><td>☐</td></tr> <tr><td>Material</td><td>☐</td><td>Use for Testing</td><td>☐</td></tr> <tr><td>Internal Transport</td><td>☐</td><td>Poor Information</td><td>☐</td></tr> <tr><td>Tribal Knowledge</td><td>☐</td><td>Rushing</td><td>☐</td></tr> <tr><td>LOA</td><td>☐</td><td>Product Improvement</td><td>☐</td></tr> <tr><td>Substation</td><td>☐</td><td>Process Improvement</td><td>☐</td></tr> <tr><td>Past Expiry Date</td><td>☐</td><td>Manufacturing Process</td><td>☐</td></tr> <tr><td>Misidentified</td><td>☐</td><td>Past Due</td><td>☐</td></tr> </table>		Environment	☐	No Re-verification	☐	Design	☒	Operator	☐	Doc/Data	☐	Offset/Setup	☐	Equip/Tooling	☐	Supplier	☐	Handling/Pre	☐	Training	☐	Material	☐	Use for Testing	☐	Internal Transport	☐	Poor Information	☐	Tribal Knowledge	☐	Rushing	☐	LOA	☐	Product Improvement	☐	Substation	☐	Process Improvement	☐	Past Expiry Date	☐	Manufacturing Process	☐	Misidentified	☐	Past Due	☐	FAULT CATEGORY <table style="width:100%;"> <tr> <td>Pressure/Forced</td><td>☐</td> <td>Temperature/Cure</td><td>☐</td> <td>Power Loss/Surge</td><td>☐</td> <td>Positioned Wrong</td><td>☐</td> </tr> <tr> <td>Bending</td><td>☐</td> <td>Set-up</td><td>☐</td> <td>Folio/Program</td><td>☐</td> <td>Outside Dimensions</td><td>☒</td> </tr> <tr> <td>Centre Not Concentric</td><td>☐</td> <td>BOM/Route</td><td>☐</td> <td>Grain</td><td>☐</td> <td>Over/Under tolerance</td><td>☐</td> </tr> <tr> <td>Cracks</td><td>☐</td> <td>Broken/Damage/Defect</td><td>☐</td> <td>Weld</td><td>☐</td> <td>Part Incorrect</td><td>☐</td> </tr> <tr> <td>Crimp/Kink/Ripple/Wave</td><td>☐</td> <td>Inspection Incomplete/Unqualified</td><td>☐</td> <td>Wrong Stock Pulled</td><td>☐</td> <td>Part Lost/Missing</td><td>☐</td> </tr> <tr> <td>Cuffs</td><td>☐</td> <td>Contamination</td><td>☐</td> <td>Out of Sequence</td><td>☐</td> <td>Part Moved</td><td>☐</td> </tr> <tr> <td>Crushing</td><td>☐</td> <td>Countersink</td><td>☐</td> <td>Off-set</td><td>☐</td> <td>Drawing</td><td>☐</td> </tr> <tr> <td>Heat Treat</td><td>☐</td> <td>Cut Too Short</td><td>☐</td> <td>Mislabeled</td><td>☐</td> <td>Finish</td><td>☐</td> </tr> <tr> <td>Wave/Twist in Tube</td><td>☐</td> <td>Instructions Incomplete/Unclear</td><td>☐</td> <td>Fit/Function</td><td>☐</td> <td>Misread</td><td>☐</td> </tr> <tr> <td>Marks/Chatter</td><td>☐</td> <td>Drill Holes</td><td>☐</td> <td>Misaligned/off center</td><td>☐</td> <td>Turning Sequence</td><td>☐</td> </tr> </table>						Pressure/Forced	☐	Temperature/Cure	☐	Power Loss/Surge	☐	Positioned Wrong	☐	Bending	☐	Set-up	☐	Folio/Program	☐	Outside Dimensions	☒	Centre Not Concentric	☐	BOM/Route	☐	Grain	☐	Over/Under tolerance	☐	Cracks	☐	Broken/Damage/Defect	☐	Weld	☐	Part Incorrect	☐	Crimp/Kink/Ripple/Wave	☐	Inspection Incomplete/Unqualified	☐	Wrong Stock Pulled	☐	Part Lost/Missing	☐	Cuffs	☐	Contamination	☐	Out of Sequence	☐	Part Moved	☐	Crushing	☐	Countersink	☐	Off-set	☐	Drawing	☐	Heat Treat	☐	Cut Too Short	☐	Mislabeled	☐	Finish	☐	Wave/Twist in Tube	☐	Instructions Incomplete/Unclear	☐	Fit/Function	☐	Misread	☐	Marks/Chatter	☐	Drill Holes	☐	Misaligned/off center	☐	Turning Sequence	☐
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Wave/Twist in Tube	☐	Instructions Incomplete/Unclear	☐	Fit/Function	☐	Misread	☐																																																																																																																																
Marks/Chatter	☐	Drill Holes	☐	Misaligned/off center	☐	Turning Sequence	☐																																																																																																																																
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12/5/14 *JP*

Lug Analysis for D5380-041 B174730 per Niu Section 7.5. Chamfer on one side of basket attachment holes is 0.5"x90 degrees. Conservatively assume reduced bearing surface is entire lug thickness to determine allowable loads for comparison to test loads of TR-D066-1016-1 to show that lugs are not critical.

$$D := 0.375 \cdot \text{in}$$

Hole diameter

$$t := 0.167 \cdot \text{in}$$

Lug thickness (deviated per B174730)

$$a := 0.62 \cdot \text{in}$$

Edge distance

$$W := 1.24 \cdot \text{in}$$

Lug width

$$F_{tu} := 38000 \cdot \text{psi}$$

Ultimate tensile strength QQ-A-200/8 per MMPDS-07

$$F_{tux} := 37000 \cdot \text{psi}$$

Ultimate tensile, across grain

$$F_{tyx} := 33000 \cdot \text{psi}$$

Yield tensile, across grain

$$\text{ratio1} := \frac{D}{t} = 2.246$$

$$\text{ratio2} := \frac{a}{D} = 1.653$$

$$K_{br} := 1.3$$

Shear-bearing efficiency factor, Niu Fig 7.5.3

$$A_{br} := D \cdot t$$

$$P_{bru} := K_{br} \cdot A_{br} \cdot F_{tu} = 3094 \text{ lbf}$$

Allowable ultimate load for bearing failure, Niu formula 7.5.1

$$A_t := (W - D) \cdot t = 0.144 \text{ in}^2$$

Min net section for tension

$$\text{ratio3} := \frac{W}{D} = 3.307$$

$$K_t := 0.35$$

Tension efficiency factor, Niu Fig 7.5.4

$$P_{tu} := K_t \cdot A_t \cdot F_{tu} = 1921 \text{ lbf}$$

Allowable ultimate load for tension failure, Niu formula 7.5.2

$$\text{ratio4} := \frac{1921 \cdot \text{lbf}}{A_{br} \cdot F_{tu}} = 0.807$$

$$C := 1.1$$

Yield factor, Niu Fig 7.5.5

$$P_y := C \cdot \frac{F_{tyx}}{F_{tux}} \cdot 1921 \cdot \text{lbf} = 1885 \text{ lbf}$$

Allowable yield load on lug, Niu formula 7.5.5

The basket loads of TR-D066-1016-1 are distributed onto a total of 8 lugs. This analysis shows that the strength of a single lug (1885 lb yield) is greater than the maximum ultimate load on the entire basket (1243lb+376lb drag) per TR-D066-1016-1. Therefore these lugs are not critical and the larger chamfer is acceptable.